Investing in a connected future

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Western Area
Power Administration

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Good afternoon, everyone. Thank you for inviting me here again to share what we are doing to support our customers in this rapidly changing energy world. I especially want to extend my appreciation to Bill Drummond and the Midwest board for their support, leadership and the cooperative partnership they have cultivated between WAPA and their members. It has been a welcome change and advanced the mutual benefits we all receive by working together.

For the past 41 years, we have remained committed to ensuring the value of WAPA for our customers and the nation. At the same time, we are looking toward the future – a connected future – and ensuring we are investing appropriately to preserve and strengthen that value to customers, our neighbors and the nation.

We are investing in the connected energy future by being agile, integrated, responsive, engaged and resilient. And we are making those investments while staying true to our core values and mission to keep rates as low as possible consistent with sound business principles.

Our hydropower continues to be among the most affordable generation sources in the nation, supporting low electric rates across our service territory. Nearly 80 percent of our customers experienced stable or decreased rates this year. For the second consecutive year, the 415 customers receiving hydropower from the Pick-Sloan Missouri Basin Program – Eastern Division and Loveland Area Projects experienced decreased rates. If we continue to see normal water conditions, we expect the UGP rate to remain stable for a few years.

During a great water year, Upper Great Plains customers received additional benefits as we avoided purchase power expenditures and marketed surplus generation into the Southwest Power Pool for a net market revenue of more than $48 million dollars.

Rocky Mountain also benefitted from slightly higher-than-average generation earlier in the year. Both regions announced that the drought adder would remain at zero, supporting stable rates.

The energy future

I recently published an article in Public Utilities Fortnightly on the future of the energy industry titled “The kilowatt-hour is dead; don’t send flowers.”

In the article, I suggest that the traditional issues we concern ourselves with now, such as new forms of generation and regulations, are not the true disruptive forces that will upend our industry. Instead, they revolve around several currently disconnected, but rapidly advancing, societal changes that will create a reimagining of the energy enterprise. These changes include blockchain, artificial intelligence, consumer control and battery storage.

I believe these societal revolutions will create a grid that is smarter, more connected and more integrated than ever before. We are going to spend this year and the next few years working to understand and investing in that connected future.

The reason we should care about these changes—why YOU should care about these changes—is that they will both directly and indirectly affect grid operations, other utilities and relationships with consumers.

If we fail to recognize how the energy landscape will change and do not invest wisely in a new energy future, it puts our joint business model at risk. Recall, for instance, that the Upper Great Plains region recognized that organized markets were forming around them in the Eastern Interconnection and that our bilateral trading partners would drop from over 50 to just four. This early recognition of a changing energy landscape led to many studies of alternatives and the ultimate move to Southwest Power Pool.

What do I believe this connected future will look like?

This future grid must accommodate a world where generation and consumption can happen in a single place. The linear grid of the past will become a web of energy and financial transactions divorced from the traditional kilowatt-hour and time-of-use methodologies we have used for decades to establish rates.

It is a future in which consumers reject the perceived limitations of utilities to form their own community-sourced energy, as we see in California. Consumers will become active participants in energy decisions, desiring the same level of control over their energy use as they do over when and where they watch their TV shows– for the same price they pay today. Artificial intelligence and blockchain will support them in this. Consumers will have more involvement and more power – pun intended – to determine when, how and from where they receive their electricity.

A future where we see the fruition of the Electrification of Everything – including and especially transportation. As Forbes recently published, the journey of today's electric vehicle from New York to Florida requires 286 pounds of coal, 2,500 cubic feet of natural gas, 7 days of 10-kilowatt rooftop solar array or 33 minutes of a giant offshore wind turbine, not your neighborhood turbine, a monstrous offshore turbine, to accomplish what 40 gallons of gas does today. Imagine that multiplied by the 276 million registered vehicles on the road today.

This is a future in which renewable, carbon-free and traditional generation all play roles – albeit different roles than the ones they serve today. We see this transformation in the number of energy-related ballot initiatives in the past election. California just passed a bill to be 100 percent carbon free instead of 100 percent renewable. That is a game changer that opens the door for nuclear generation and large-scale hydropower to participate in a carbon-free market.

That California duck curve is going to waddle across the West. In 2019, SPP expects enough wind capacity in its territory to meet its minimum load, if they can handle the daily average 10-gigawatt swing. It is becoming less expensive to install new renewable generation facilities than to maintain existing fossil fuel plants.

This is an energy future in which battery storage, although limited to a mere four hours of life with current technology, begins popping up on the grid. Bloomberg forecasts that the global energy storage market will attract $620 billion in investment by 2040 and that energy storage will be equivalent to 7 percent of the global installed power capacity in 2040, most of that happening first at the utility level.

What do I think about battery storage? It would take 60,000 tractor trailers of battery storage to replace only WAPA's nameplate capacity in hydropower for **one day**. Yet, it is impossible to ignore the level of interest and investment and what it could mean for all of us.

Another takeaway we see from all this change is, despite behind-the-meter generation and storage, there is no such thing as a microgrid without a macrogrid. Transmission and distribution systems will become more important, not less important, in a connected future.

As we move to decarbonize our nation, load profiles will shift dramatically, and this shift may happen deeper, quicker, sooner and have more impact that people anticipate.

Many of these evolutionary changes will affect you sooner than WAPA. However, what affects you will ultimately affect us. It would be foolish to think that such radical changes to the distribution system – to you – will be confined to power lines less than 100 kilovolts, and that WAPA will continue on its historic mission unaffected and insulated from industry events while you face a new world of consumer demand and control.

We are, with your support, positioning WAPA in a way that will optimize your ability to respond to and accommodate the continuously evolving future. We at WAPA believe in that connected future, so we are investing in being:

- Agile
- Integrated
- Responsive
- Engaged
- Resilient

2019 Tactical Action Plan

In 2019, we will release our updated Tactical Action Plan, which shares our activities and priorities for the next two to three years under Strategic Roadmap 2024. In it, you will see how we are investing in our connected future. We use the TAP to align our annual performance targets, which we report on quarterly.

My direction to employees in the fiscal year 2021 budget guidance was to remain budget and staff neutral as we continue to mature our programs, prepare for the future and improve our performance.

I truly believe we have the right amount of employees at WAPA now to complete these tasks, but they may not be in the right places. We will be having difficult discussions at the senior manager table to ensure every employee is investing in the connected future in a way that provides value to our customers and mission.

Our Continuous Process Improvement program has achieved more than $72 million in mostly avoided costs since its inception. Projects this year focused on implementing time-saving technologies, such as using misting devices to repel birds from roosting in expensive substation equipment.

We also decided to eliminate the Equipment Loan Program. Popular in the early 1990s, the Equipment Loan Program served its use in the emerging energy efficiency movement, but now there are organizations that can provide better services than we could ever accomplish. So, after several years, we have retired the program, saving about $177,000 annually.

We are going to continue to have hard conversations and closely evaluate what staff—what WAPA—is spending time on to ensure every dollar we spend, every hour we work, is relevant and provides value to our customers.

Mission-Critical Customer Services in an Evolving Industry

The first Strategic Target Area Mission-Critical Customer Services in an Evolving Industry incorporates activities such as preparing for markets. This target area builds upon the successes of the recent past to continue maturing WAPA and our services to meet your needs now and in the future.

Mountain West Transmission Group

First is an activity that may not seem like a grand accomplishment: the deferral of the Mountain West Transmission Group effort to join SPP. When two of the Mountain West members decided to withdraw from the group earlier this year, it changed the economic and fundamental dynamics of the initiative. The prudent decision for WAPA and our customers, as well as the remaining members, was to put the effort on hold. We will spend the next year focused on preparing for new reliability coordinators this coming year.

We greatly appreciate the Mountain West members and the strong partnerships we have formed to adapt to the evolving electricity industry.

RC services

As you likely know, our current RC provider, Peak Reliability, will cease operations by the end of 2019. NERC requires all balancing authorities and transmission operators to have a reliability coordinator, meaning we need to secure new RC arrangements for each of our operating areas.

Western Area Upper Great Plains – West, the Western Area Colorado Missouri and the Western Area Lower Colorado balancing authorities, which also include our transmission operators, will transition to Southwest Power Pool RC in late 2019.

We still strongly believe markets are coming to the West. Like what happened with UGP and SPP, I believe the connected energy future will compel utilities to join markets or market-like entities to handle the increasing complexity of our business.

Mountain West may have been postponed and the California Independent System Operator may not have been able to wrest its governance from a state board this year, but the groundwork has been laid for organized markets in the West. We will continue to invest in our relationships with our customers and neighbors to realize balancing authority and transmission efficiencies, reduce cost shifts within WAPA to join a market and seize any and all opportunities to reduce or eliminate barriers for the next time we attempt membership.

Organizational Approach to Markets
Internally, we are taking an Organizational Approach to Markets to respond to industry change and continue meeting customers' needs with the efficient, responsive and at-cost services we have in the past. A stronger WAPA is a stronger business partner to build our desired energy future. This initiative will realign our resources, clarify our processes, streamline our systems and implement modern technologies.

NERC Compliance Program
We are actively engaged in activities that will improve the efficiency and effectiveness of our NERC Compliance Program, including reducing the number of auditable entities. These changes will free up resources to address other emerging issues.

Asset Management 2.0
We have exciting news on the asset management front: We have determined the condition-based health index of all transmission lines at 100 kilovolts and higher. This effort involved documenting data points for more than 178,000 structures across WAPA's territories. The health index encompasses a number of different factors to determine a component's health rather than relying only on the age of the equipment.

Using data as an asset, we will transition into Asset Management 2.0, which creates lifecycle management strategies based on data that look at the system as a whole instead of individual components. Like many utilities, we have data. In fact, we are drowning in data. The Asset Management team will work on making the raw numbers useful in determining what investments need to be made, when and where for the optimal reliability of the grid.

Grid Resilience

We will also continue to safeguard our valuable assets against those wishing to disrupt our electricity and, by extension, our economy and way of life. Here is a picture of what those threats look like on the cybersecurity side.

In 2018, federal partners verified more than 20,000 threats to the government and industry that required research by the 18 members of WAPA's cybersecurity staff. For context, that is one cybersecurity specialist per 90 employees and more than 1,000 threats. These cybersecurity specialists are also the shields for our critical energy infrastructure information systems across WAPA, staying one step ahead of state-sponsored, terrorist and other hackers.

Our tools identified more than 10,000 individual cases of suspicious activity on our system in FY 2018. More than 97 percent of these were investigated and resolved in two days. In an average day, WAPA's firewalls are pinged nearly 200,000 times by suspicious or potentially damaging events. Make no mistake, this is a job that requires perfection.

Protecting the grid against these threats is not something one utility can do alone. When we talk about investing in a connected future, we are not only speaking from an economic standpoint. Investments happen in several ways: in relationships, in training, in people and in being innovative and inclusive. In the realm of security, we need to all work together to collaborate on threat information, share leading practices and identify effective security strategies that reduce our vulnerabilities without breaking the bank.

We held a Technology and Security Symposium for customers this summer to hear from industry leaders about cyber and physical threats to the grid, discuss mitigation strategies and network about what attendees were doing to combat these threats.

It is through information sharing and collaboration like the symposium that we can support our customers and invest wisely in the energy frontier.

People and Organization

We are also investing in our people – that critical resource that keeps WAPA running all day, every day. There are no widgets that can replace a single employee. One of the important topics facing us and all of you is the ability to recruit and retain talent.

Each year, employees complete the Federal Employee Viewpoint Survey, identifying how we are doing in terms of leadership, overall work environment and providing appropriate resources and training. For the past five years, our scores have continued to increase, due in large part to the engagement from leaders at all levels and a willingness to directly address the weaknesses in our organization that the survey reveals.

We instituted a new position in our 24-hour operations centers to conduct a real-time assessment of the power system every 30 minutes. The real-time engineers were created in response to a

NERC standard that requires power system operators to predict and prepare for a spectrum of contingencies in the bulk electric system every 30 minutes. The grid must be able to withstand any contingency without exceeding system operating limits. I believe this is an area where AI will play a key role in the future.

This is important because as our grid becomes more complex, as trading partners decrease, as distributed generation drops on and off the system, we must be able to respond quickly and ensure the continued reliability of the transmission grid on which hundreds of millions of people depend.

We completed the Power Repayment Study, on time and within budget, and are retiring two expensive and time-consuming legacy Power Repayment systems. We continue to improve our organizational alignment. This year, we split the Office of the Chief Operating Officer and created the Office of the Chief Administrative Officer to provide a more realistic scope of control for senior leadership with the same staff.

In the next couple of years, we will also mature our zero-incident safety program into Human Performance and Just Culture that improves procedures and empowers employees to eliminate risk before a potentially dangerous environment materializes. The zero-incident safety program consistently delivers incident rates below the Occupational Safety and Health Administration's average for electric workers – one of the most dangerous fields in the world. We attribute our success to an open dialogue between field workers and office staff, encouraging positive reinforcement and nonpunitive sharing of near misses and lessons learned.

By continuing to improve on preventing, detecting and correcting human errors and eliminating weaknesses in our organization's procedures, we can reduce time lost due to injury even further.

We are preparing the next generation of leaders at WAPA who are not only competent at their technical duties but also possess the critical leadership skills that propel a good organization to a great organization. These leaders will embody core values, transparency and trust and advance WAPA's mission to meet customer needs.

Transparency

Finally, we will continue to work with you on our transparency efforts. This year, we posted 10 years' worth of financial and operational information to The Source. We will update this information annually, which includes:

- Rates and sales data by power system
- Federal full-time equivalents
- Regional and Headquarters expenditures
- Capital investments by project

We chose to provide this specific information based on multiple conversations with our customers and other stakeholders. The site and our additional transparency efforts were recently

awarded a Corporate Social Responsibility Award by a prominent international public relations organization.

We will continue to honor our spirit of transparency, to do what is right and what is safe to quote one of our core values.

Other initiatives

As I said before, I truly believe we have the right amount of staff to accomplish our mission and invest in the connected energy future. However, I think we can all see we will not be receiving a windfall of appropriations in the foreseeable future. I am equally sure the pressure on purchase power and wheeling funding will not abate. I look forward to working with you to manage these issues differently in the future.

Fiber

Another partnership opportunity regards fiber. WAPA has about 5,200 miles of fiber optic lines to communicate remotely with substations, and the fiber is not being used to its maximum potential currently.

We need to close certain gaps in our fiber network and increase communication capacity to support data collection and future technologies for security and other advanced control systems.

At the same time, we are working with customers and the Department of Energy to evaluate where there are partnership opportunities to improve our fiber network, broaden access to customers and potentially expand networking and data-access capabilities for DOE to monitor critical energy infrastructure information.

Battery storage

I have tasked my regional managers to become better acquainted with options for storage. We hear from customers that this is the biggest technology disrupter they face right now. We want to work with our customers to identify opportunities to interconnect transmission-scale battery storage to WAPA's system.

We have zero interest in owning this storage asset, just like we have zero interest in owning a wind or solar farm. We would like to partner with you on connecting these assets to the WAPA system to take advantage of the benefits it would offer, including balancing load, increasing resource diversity and managing the variability of water. We are ready and waiting to have these discussions with you.

Conclusion

As we head into an energy frontier, we envision a future more connected than ever before. And an industry that is also flatter and has more demands placed on it than we have seen previously.

What is happening to the grid now is not related to the physics we have known for more than 100 years. It is related to information technology, financial change and new ways consumers think about energy and their power over their choices. We must become technologically adept to adapt and thrive in this new electronic world.

Let me be clear that we are not looking to be on the leading edge of this future or to lead this future. But we must invest in this future to remain relevant. It is only by remaining relevant that we will preserve and strengthen the value of our hydropower and transmission services for our customers.

We will invest in the connected future by being:

- **Agile**—responding to changes in the industry, including from regulatory bodies; evolving our Open Access Transmission Tariff to be more in line with the pro-forma OATT; and preparing for markets and market-like entities in the West.
- By being **Integrated**—accommodating battery storage and new technologies; partnering on fiber and other similar opportunities; and developing a workforce of the future.
- By being **Responsive**—acting on customer requests for transparency and needs in the future; and seeking occasions to partner on commons issues facing us.
- By being **Engaged**—listening to our customers to determine how we can support you now and in the future; connecting you with subject matter experts on today's big topics in open and safe discussions on the realities for the grid; and by participating in the big conversations.
- By being **Resilient**—defending and combating against physical and cyber threats; adapting to potential new long-term water conditions; and advancing financial security that looks different than today for appropriations and purchase power and wheeling.

And, above all, we invest in a connected future by serving like our lights depend on it. This is an exciting time to be part of the energy industry. We look forward to continuing our partnership with you – our customers – for the next 40 years and beyond.

Thank you.